

a cooling device for cooling the subject placed on the susceptor to a predetermined temperature, and

a supply section for adding a reactive gas to an activated plasma generating gas activated by the plasma generation section and caused to flow toward the subject cooled by the cooling device,

wherein an activated reactive gas is generated by adding the reactive gas to the activated plasma generating gas, and the activated reactive gas is reacted with a surface layer of the subject cooled by the cooling device.

~~33.~~ (New) The surface treatment apparatus according to claim ~~32~~, which is an apparatus for removing a native oxide film from a surface of the subject to be treated.

~~34.~~ (New) The surface treatment apparatus according to claim ~~32~~, wherein the predetermined temperature at which the subject placed on the susceptor is cooled, is not higher than room temperature.

~~35.~~ (New) The surface treatment apparatus according to claim ~~32~~, wherein the predetermined temperature at which the subject placed on the susceptor is cooled, ranges from 20°C to -20°C.

~~36.~~ (New) The surface treatment apparatus according to claim ~~32~~, wherein the predetermined temperature at which the subject placed on the susceptor is cooled, ranges from 10°C to -20°C.

~~37.~~ (New) The surface treatment apparatus according to claim ~~32~~, further comprising:

a heating device for heating a product produced by a reaction between the activated reactive gas and the surface layer of the subject.

~~38.~~ (New) The surface treatment apparatus according to claim ~~37~~, wherein the

heating temperature is not lower than 100°C.

~~39.~~ (New) The surface treatment apparatus according to claim ~~37~~, wherein the heating device is heat radiation means provided above the subject to be treated.

~~40.~~ (New) The surface treatment apparatus according to claim ~~37~~, wherein the heating device is a heating lamp provided above the subject to be treated.

~~41.~~ (New) The surface treatment apparatus according to claim ~~37~~, further comprising a lifting device for lifting the subject to be treated, to move the subject away from the susceptor when heating the product with the heating device.

~~42.~~ (New) The surface treatment apparatus according to claim ~~32~~, wherein the reactive gas supply section includes a number of gas exhaust holes formed in an inner wall of the treatment vessel.

~~43.~~ (New) The surface treatment apparatus according to claim ~~32~~, wherein the reactive gas supply section includes a shower head having a number of gas exhaust holes provided in the treatment vessel.

~~44.~~ (New) The surface treatment apparatus according to claim ~~32~~, wherein the reactive gas supply section supplies the reactive gas to the activate gas species in position at least 20 cm away from an end of the plasma generation section in a direction of the subject to be treated.

~~45.~~ (New) The surface treatment apparatus according to claim ~~33~~, wherein the plasma generating gas contains an H₂ gas and the reactive gas contains a fluorine-containing gas.

~~46.~~ (New) The surface treatment apparatus according to claim ~~45~~, wherein the fluorine-containing gas is an NF₃ gas.

16. (New) The surface treatment apparatus according to claim 45, wherein the plasma generating gas contains an N₂ gas.

17. (New) A cluster system comprising:

the surface treatment apparatus according to claim 33;
a carrier chamber in which a carrier robot for carrying the subject is provided connected to the treatment vessel of the surface treatment apparatus;
and a metal-wiring forming chamber connected to the transfer chamber,
wherein the cluster system is capable of carrying the subject in an unreactive atmosphere such that a native oxide film can be prevented from being regenerated while the subject is being carried in the atmosphere.

18. (New) A cluster system according to claim 48, further comprising:

a load lock chamber connected to the carrier chamber,
a heating chamber, connected to the carrier chamber, for pre-heating the subject to be treated; and
a cooling chamber connected to the carrier chamber.

19. (New) The surface treatment apparatus according to claim 48, wherein the metal-wiring forming chamber is a chamber for forming a film of at least one of Al, Ti, TiN, Si, W, WN, Cu, Ta, TaN and SiN.

20. (New) The surface treatment apparatus according to claim 48, wherein the metal-wiring forming chamber includes means for heating the subject to a temperature of 100°C or higher.